

STUDIES IN LIFE HISTORIES OF NORTH AMERICAN LEPIDOPTERA CALIFORNIA ANNAPHILA II¹

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IN CARRYING ON STUDIES of life histories of *Annaphilas*, prior to March 1964, a number of incomplete records and drawings were made which were withheld in the hope that additional information might be obtained. It now seems advisable to record these, as they may aid workers who are planning to publish more complete life histories.

***Annaphila astrologa* Barnes & McDunnough**

In our published notes prior to March 1964 we were unable to describe and illustrate the ovum of *Annaphila astrologa*. Later, eggs were obtained, and additional information recorded. Location of capture was the northeast rim of Bobs' Gap, Holcomb Ridge, Mojave Desert, Los Angeles County, elevation 4200 feet. The eggs were laid on *Emmenanthe penduliflora* Benth.

Egg: (Fig. 1 A)

Spherical, 0.5 mm. wide by 0.4 mm. tall.

Color, bright yellow. The surface is covered with 48 to 50 ridges, arising from the base and terminating near the micropylar depression. Several coalesce superiorly. Ridges are topped by a line of pearl-like nodules or expansions. They are closely crowded together, and there are apparently no cross lines between them. Eggs hatched April 9, 1964.

FIRST INSTAR LARVA: (One day after hatching)

Length, 2.5 mm.

Head width approx. 0.4 mm. Jet black.

The body is narrower than the head. It is cylindrical and translucent, and is tinged with light green from the first segment to about the eighth. The cauda is light yellow. The cervical shield is distinct, and is spotted with black. Legs, black. Prolegs, distally black.

SECOND INSTAR LARVA:

Head width 0.7 to 0.75 mm. Mottled yellow-green and black.

¹Illustrations reproduced from water color drawings
by

J. A. Comstock

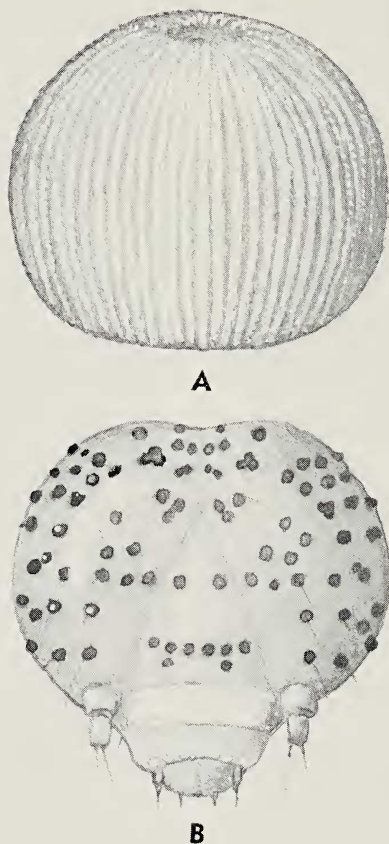


Fig. 1. *Annaphila astrologa* Barnes & McDunnough. A. Egg, enlarged X 95. B. Front view of head, enlarged.

Body, 7 mm. long. Color, deep green, with rows of small brown tubercles, each bearing a colorless seta. Legs tipped with black. Prolegs, yellow with brown crochets.

The third instar larva was described and illustrated in our prior paper (1964) but the distinctly marked and spotted head was reproduced on too small a scale to be clearly defined.

It is now pictured on Figure 1 B.

Head width is 1 mm. It is studded with numerous brown dots and blotches. Those which bear setae are raised. The ground color of the face is yellow with a tinge of green. The antennae and labrum are white.

Additional larvae were taken on the Mulholland Highway in the Santa Monica Mountains, May 16, 1965. The pupa illustrated in our prior paper (1964) was taken at Red Rover Canyon, southwest of Acton, Los Angeles County, elevation 3200 feet, May, 1963.

Larvae of all the *astrologa* complex produce their pupal chambers by cutting into pithy wood.

A colored figure of the moth was included by Draudt in Seitz, Vol. 7, 47e, 1927.

The type locality is Redington, Arizona.

REFERENCE

COMSTOCK, JOHN ADAMS and CHRISTOPHER HENNE, 1964. Studies in Life Histories of North American Lepidoptera. California Annaphilas. *J. Res. Lepid.* 3 (3): 175-191.

***Annaphila pseudoastrologa* Sala**

This species was published by Frank P. Sala in 1963. Prior to that he submitted a pupa under the manuscript name which we then illustrated and held for later verification.

In addition, we had taken larvae of the same species feeding on the flowers and buds of *Phacelia mincr* Thell, at Vasquez Rocks, Sierra Pelona Valley, Los Angeles County, April 1963.

There is still need of the ovum to complete the life history, but it is hoped that Sala will include this in his promised life history study.

LARVA, INTERMEDIATE STAGE: (Fig. 2 A)

Length, 8.5 mm. Head width, 1 mm.

Head is glistening light green, speckled with brown, heaviest over the crown. Ocelli, black. Mandibles edged with brown. Body, dark olive-green, with numerous raised white nodules, topped by relatively long setae. Middorsally, a narrow longitudinal white stripe, and dorso-laterally a similar stripe paralleling it. Below this, the body color gradually changes to a deep rose-purple, which extends downward to the spiracular line where it abruptly gives place to a deep green. This green also covers the entire venter. The spiracles stand on elevated nodules. They are black-centered with white circlets surrounded with rose-purple blotches. The caudal area has a considerable blotching of rose-purple, extending over the dorsum. The white setae

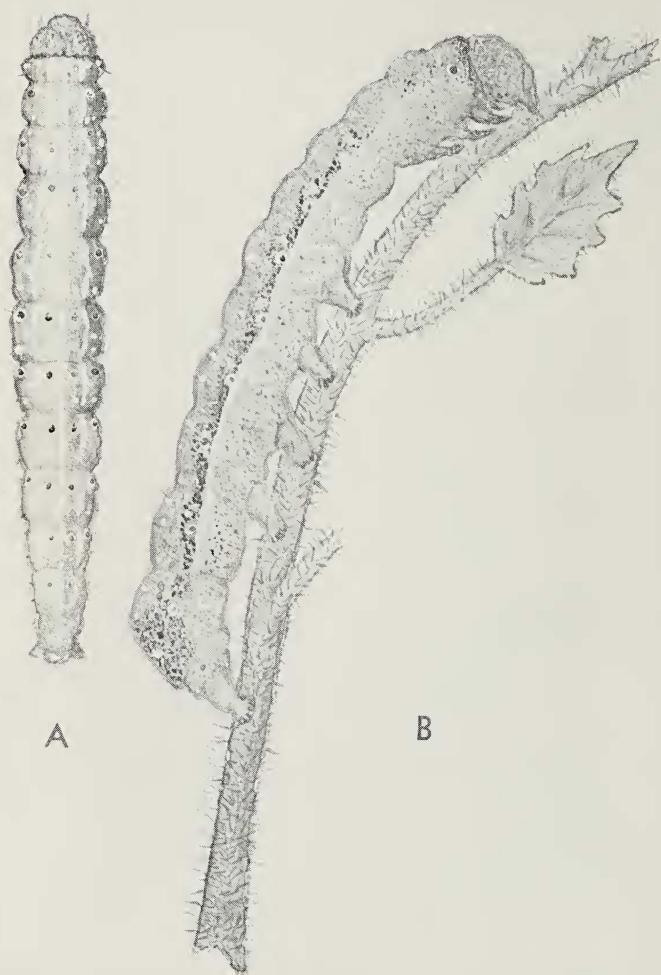


Fig. 2. *Annaphila pseudoastrologa* Sala. A. Larvae, intermediate instar, X 10. B. Mature larva approximately X 5.

are mounted on elevated nodules with black centers and white circlets. The legs and prolegs are green. Later, the rose-purple invades most of the dorsal surface.

MATURE LARVA: (Fig. 2 B)

Length, 20 mm. Width, through center, 3 mm. Head width, 2.1 mm. Head color is glistening light yellow, heavily sprinkled with light brown blotches and spots over the upper part of

cheeks and along the sides of the epicranial suture. The front is unspotted. Ocelli, dark brown, resting on yellow bases. Mandible, black. Setae, soiled white, arising from minute brown nodules.

First thoracic segment of body, yellow, with an orange cast, weakly mottled with light brown and white spots over dorsum, strongly blotched with brown laterally. There is a narrow middorsal white stripe. Remaining segments, basically yellow-green with thick spotting and mottling of darker green. As the spiracular area is approached, spotting changes to red-brown, with the black-centered and white-rimmed spiracles standing out in strong contrast. In caudal area, red-brown spotting extends over dorsum. There is a bare suggestion of a longitudinal middorsal stripe, formed by indistinct darker spots. Venter, unspotted light green. Legs, soiled yellow-green. Prolegs, mottled light green with brown crochets. All setae, relatively short and white, resting on small white papillae with minute black centers.

Prior to pupation the larva assumes a deep mottled purplish-brown color above the spiracular line, and the ventral green area becomes heavily mottled with purplish-brown and minute white dots. The stigmatal line becomes more pronounced and is lighter.

Thereafter the larva begins to chew its way into soft pithy bark, in which it weaves a pupal chamber.

In addition to *Phacelia minor* the food plant has been noted as *Phacelia parryi* Torrey.

PUPA: (Fig. 3 A, B, C.)

Length, 9.25 mm. Greatest width, 3 mm. Fusiform. Head rounded. Eyes relatively small. Maxillae terminate almost at the margin of the wing cases. Antennae, slightly shorter. Cremaster terminates in two short recurved spicules pointing laterally, and two minute spikes pointing caudally.

General body color, rich chestnut brown with lighter shade on the wings and abdominal segments. Antennae, nearly black. Wing cases, marked with an assemblage of buried black dots, predominating on forward half of wing, irregularly placed.

Body surface texture, predominantly finely rugose, but maxillae and leg cases bear fine raised striations. Other structural features are adequately shown in the illustration.

Our first pupa was obtained in 1956 from Frank Sala. It was collected in Latego Canyon above Seminole Hot Springs, Los

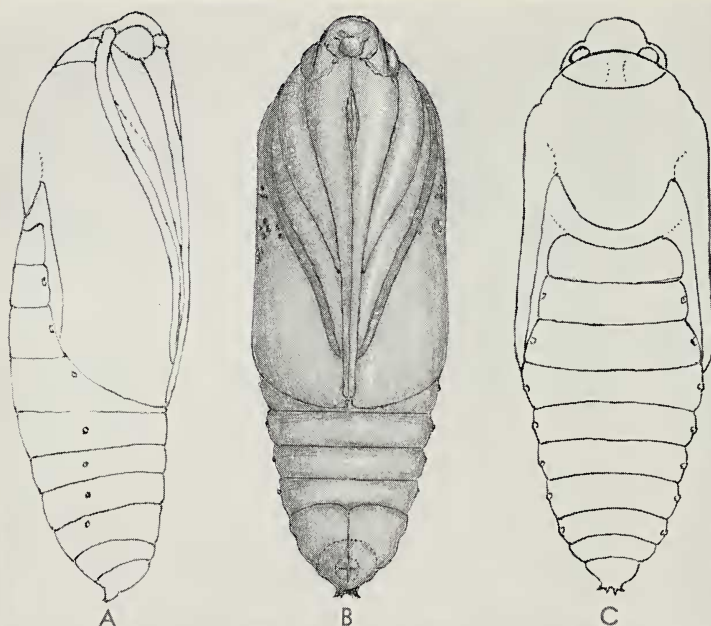


Fig. 3. *Annaphila pseudoastrologa* Sala. Pupa, A. lateral, B. ventral, and C, dorsal aspect, approxim. X 7.

Angeles County, which its author later designated the type locality. The moth is pictured on pages 290 and 292 of Sala's original 1963 description.

REFERENCE

SALA, FRANK P.

1963. The *Annaphila astrologa* Complex, with Description of Three New Species. Jour. Res. on the Lepid. 2 (4): 289-300.

Annaphila vivianae Sala

This species was published by Frank Sala in 1963. Prior to that (1956) he sent us pupae with his manuscript name "*vivianae*" attached, which made possible the description and drawings presented here.

PUPA: (Fig. 4 A,B,C)

Length, 9.5 mm. Greatest width, 3 mm.

Body color, dark reddish-brown. Wings, lighter. Spiracles, dark brown.

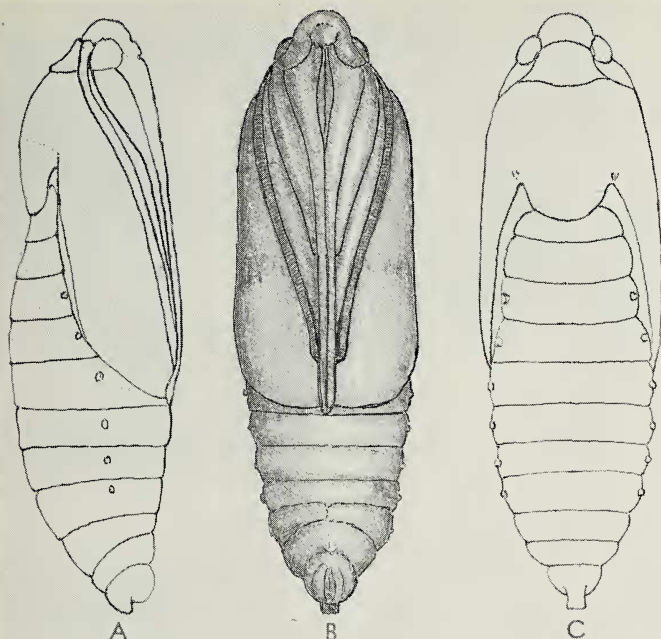


Fig. 4. *Annaphila viviana* Sala. Pupa, A. lateral, B. ventral, and C, dorsal aspect, approx. X 7.

The antennae terminate 0.8 mm. cephalad to the wing margins, and the maxillae extend slightly beyond these margins. The head is rounded and the eyes not prominent. The spiracles are slightly elevated. The cremaster is a rounded knob with a squared plate extension devoid of hooklets. Other structural features are shown in the illustration.

The range of the species is the southern Sierra Nevada Mts. Type locality, the Lower Kern River Canyon, Kern County, California. It also extends north to Three Rivers and the East Kaweah River, Tulare County. It may in addition be found throughout the range of its specific food plant, *Phacelia cicutaria* Greene, among the rocky out-croppings in the foothills of the Sierra Nevadas, from Butte County south to the Tehachapi Mountains. An additional foodplant successfully used in the laboratory was *Phacelia tanacetifolia* Benth.

REFERENCE

SALA, FRANK P.

1963. The *Annaphila astrologa* Complex with Descriptions of Three New Species. Jour. Res. Lepid. 2 (4): 289-300.

Annaphila diva Grote

This species was briefly discussed in our 1954 paper. We recently secured a mature larva, pupa, and cocoon which makes possible an illustration and a few additional notes concerning its life history.

Our larva was preparing for pupation, which may account for its somewhat darker color and foreshortening in form as compared with William H. Evans' description in the Rindge and Smith 1952 Revision of the Genus.

MATURE LARVA: (Fig. 5 A and B)

Length, 19 mm. Greatest width through center, 3 mm. Head width, 1.9 mm.

Head (Fig. 5 C) ground color, glistening soiled yellow, blotched with black, particularly over the crown. Ocelli, black. Antennae, white at base, dark on distal two-thirds. Margins of mandibles, black.

Body, predominantly striped and blotched with black, interrupted with various light lines and spots. There is a middorsal longitudinal line of dull pink, lighter on the anterior segments, gradually darkening toward the cauda. Lateral to this is a wide gray area. On the margin of this is a distinct light pinkish band running from the first to third segment. Beyond this is a wide band of mottled black running caudally, and extending downward to the wide spiracular band. This band is dull pink or pinkish-white, and it runs the entire length of the body. The black spiracles are located close to its upper margin. Several round light spots and a few irregular larger blotches occur on the body as shown on the illustration.

The cocoon was composed of soil granules. In shape it was oval — length, 10 mm. Width, 5.6 mm.

PUPA: (Fig. 5 D)

Length, 8 mm. Greatest width through center, 2.75 mm. Color throughout, uniform dull orange. Texture, glistening.

The maxillae reach to the wing margins, and the antennae are slightly shorter. The wing covers are translucent, allowing the segmental junctures to be dimly seen through them. The caudal segment is evenly rounded, and bears no spines or cremasteric hooks.

The species ranges from southern California to British Columbia.

The larval food plant is *Montia perfoliata* (Donn) Howell, and the adults have been taken in association with other species of *Montia* throughout its range.

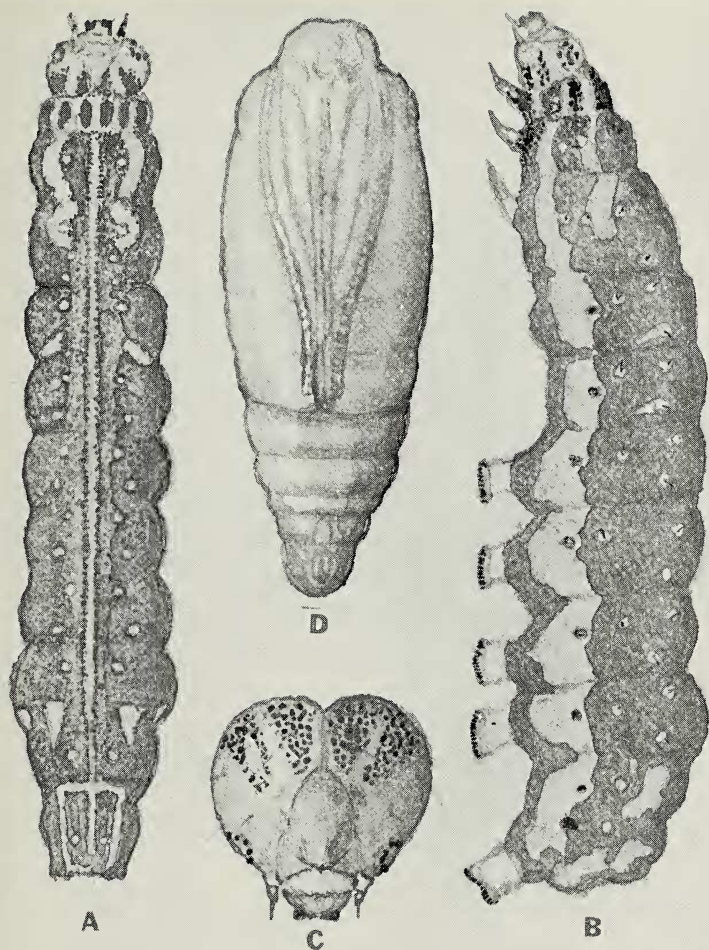


Fig. 5. *Annaphila diva* Grote. Mature larva, A. dorsal, and B. lateral aspects, X approxim. 5. Head of larva, C, X 10. Pupa, D. ventral aspect, X approxim. 8.

REFERENCES

- COMSTOCK, JOHN ADAMS and CHRISTOPHER HENNE, 1964. Studies in Life Histories of North American Lepidoptera. California Annaphils *J. Res. Lepid.* 3 (3): 175-191.
- EVANS, WILLIAM H., 1952. Rindge and Smith Rev. of the Annaphilas. pp. 238-239.
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- RINDGE, FREDERICK H. and CLAUDE I. SMITH, 1952. A Revision of the Genus *Annaphila* Grote, (Lepidoptera, Phalaenidoe), *Bull. Am. Mus. Nat. Hist.* 98 (1): 187-256.

***Annaphila spila* Rindge and Smith**

Females of this species were observed ovipositing deep in the flower bracts of *Linanthus montanus* Greene, in a meadow off Mineral King Road, East Fork Kaweah River, Tulare County, California on May 3, 1963 at an elevation of 3200 feet. Females were also confined from this locality and oviposited readily on growing plants transplanted from the field to the laboratory.

EGG: (Fig. 6 A)

Nearly spherical, slightly flattened at the base. Diameter, 0.4 mm. There are from 30 to 32 ridges running from base toward micropyle. These are knobbed along their crests. The ridges are slightly wavy and their knobbed crests are not uniform in size or direction. The grooves between the vertical ridges show minute and barely visible horizontal striae.

The micropylar depression is large and deep.

Color, bright orange, turning to riddish prior to hatching.

FIRST INSTAR LARVA: (A single example, observed May 21, 1963)

Length, 2.75 mm. Head width, 0.25 mm.

Head, jet black. Body, rich yellow with a tinge of orange. First thoracic segment with a shading of brown, due to minute dots forming a prothoracic shield. There is similar shading on the last caudal segment. There are minute dark dots on the dorsal area, some of them probably giving rise to colorless setae. Legs, shading to black at the tips. Prolegs, concolorous with the body. With only a single larva for observation, unusual care in handling was necessary, so some details were likely not noted. In spite of precaution the larva died.

The early instar larvae feed within the bracts and consume the buds of the young plants. They are not readily seen in the field at this stage. The adult larva rests upon the reddish stem of the food plant, feeding externally upon the flowers and buds, its coloration blending with that of the plant.

MATURE LARVA: (Fig. 6 B)

A single example was obtained June 13, 1963.

Length, 13 mm. Width through 9th segment, 2 mm, Width of head, 1.4 mm.

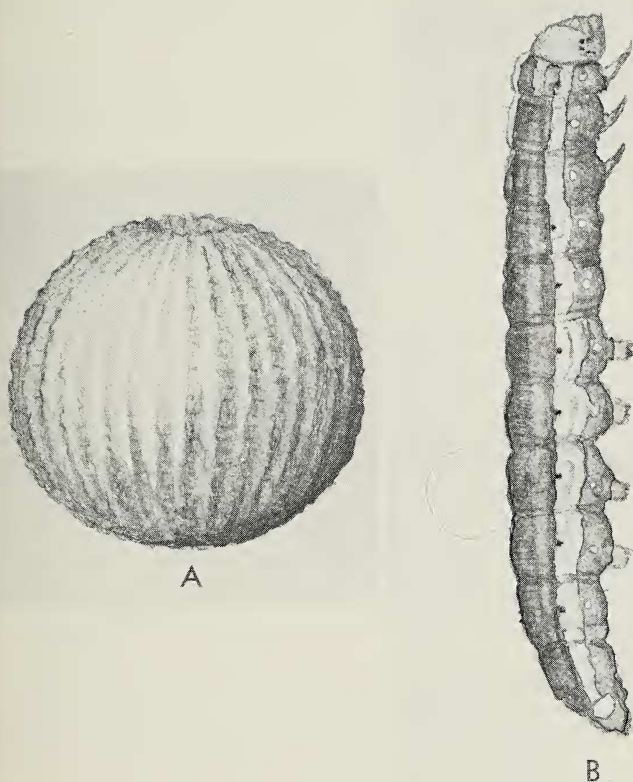


Fig. 6. *Annaphila spila* Rindge & Smith. Egg. A. approx. X 100. B. Larva, X 12.

Head, clear glistening yellow, the mouth parts slightly darker. Ocelli, black.

Dorsal half of body, deep pinkish-rose. The first segment has a middorsal yellow line extending slightly onto the 2nd segment. There is also a short dorso-lateral line on the 1st segment only. A wide stigmatal cream-colored band runs the entire length of the body. The spiracles are placed on its upper edge. Below this spiracular band the body is pinkish-rose as is also the venter. In

the middle of the venter the rose color becomes gradually lighter, with a suggestion of yellow. Spiracles, small and dark-centered, with a faintly suggested white margin below each one. Legs, translucent yellow, with dark tips. Prolegs, pinkish-rose, except for those on the head and cauda.

Our few examples failed to pupate as the flowers of the *Linanthus* became too dry for the larvae to feed upon and substitute food plants (other species of (*Linanthus*) proved unsuccessful.